source and reservoir of infection, and incubation period and control.

Plumb, J. A., and T. E. Schwedler. 1982. Enteric septicemia of catfish (ESC): a new bacterial problem surfaces. Aquaculture Magazine 8(4):26-27.
Description of *Edwardsiella ictaluri* infection of channel catfish, including clinical signs, pathology, severity, and chemotherapy.

NOTE: A fish disease specialist should be consulted for diagnostic assistance whenever a disease is suspected and before chemical treatments are used.
The use of chemicals or drugs on fish intended for human or animal consumption must be in accordance with curent laws and regulations.
Use of trade names does not imply U.S. Government endorsement of commercial products.

Some Fish Hosts of *Edwardsiella tarda* and *Edwardsiella ictaluri*.

Edwardsiella tarda

Atlantic salmon	*Salmo salar*
Black tetra	*Gymnocorymbus ternetzi*
Brown bullhead	*Ictalurus nebulosus*
Channel catfish	*Ictalurus punctatus*
Chinook salmon	*Oncorhynchus tshawytscha*
Japanese eel	*Anguilla japonica*
Emerald shiner	*Notropis atherinoides*
Hirame flounder	*Paralichthys olivaceus*
Goldfish	*Carassius auratus*
Grass carp	*Ctenopharyngodon idella*
Largemouth bass	*Micropterus salmoides*
Striped mullet	*Mugil cephalus*
Striped bass	*Morone saxatilis*
Nile tilapia	*Tilapia nilotica*
Yellowtail	*Seriola quinqueradiata*

Edwardsiella ictaluri

Brown bullhead	*Ictalurus nebulosus*
Channel catfish	*Ictalurus punctatus*
Danio	*Danio devario*
Blue tilapia	*Tilapia aurea*
White catfish	*Ictalurus catus*

Copies available from
National Fisheries Research Center-Leetown
Technical Information Services
Box 700
Kearneysville, West Virginia 25430

GPO 859-465

Department of the Interior
U.S. Fish and Wildlife Service

FISH HEALTH BULLETIN No. 1

EDWARDSIELLA
INFECTIONS OF FISHES

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1989

INTRODUCTION

Cultured fish are often under stress from crowding, low levels of dissolved oxygen, presence of excretory products, etc. and are susceptible to infection by many types of bacteria. Two important disease causing bacteria are *Edwardsiella tarda* and *E. ictaluri*, the cause of enteric septicemia of catfish (ESC). Mortalities in cultured eel and catfish are caused by the adaptable and opportunistic *E. tarda*. However, *E. ictaluri* is more prevalent in catfish and often produces devastating mortalities on catfish farms.

ORIGIN AND DIAGNOSIS

The diagnosis of either bacteria is based on observed signs and isolation and identification of the bacteria in the laboratory. A sophisticated laboratory test is available to confirm the preliminary diagnosis.

PATHOLOGY

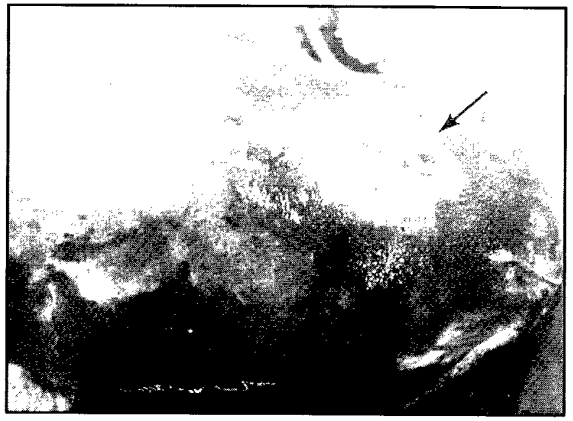
Edwardsiella tarda

Fish infected with *E. tarda* sometimes become lethargic, "hang" at the surface, and swim in a spiraling or erratic pattern. External lesions or sores vary with species. Channel catfish often develop small skin ulcers; in advanced cases, however, larger, colorless areas mark the sites of deep muscle abscesses. Other fish species exhibit other signs of infection. For example, flounders and tilapias develop swollen abdomens due to a buildup of fluid and bream develop ulcers on the head. Diseased common carp, Japanese eel, and striped bass show hemorrhages on the body and fins. In eels, lesions on internal organs may pierce the body wall and in striped bass the effect on the surface tissue sometimes gives the fish a tattered appearance.

Internally, the most common lesions are light-colored nodules on the kidneys, spleen, or liver. Large abscesses that develop in muscles of channel catfish and striped mullet and in internal organs of Japanese eels emit a foul odor when punctured.

Edwardsiella ictaluri

Channel catfish infected with *E. ictaluri* refuse feed, tend to hang at the surface, and swim with a spiral movement that includes erratic bursts. External lesions include hemorrhages around the mouth, on the sides and underside of the body, and on the fins. Other signs include pale gills, "pop-eye," and small ulcerations on



Channel catfish showing the "hole-in-the-head" lesion caused by *Edwardsiella ictaluri*.

the body. Ulceration in the frontal bones of the head gives the disease one of its common names, "hole-in-the-head disease". Internally, small hemorrhages develop throughout the organs and in the membrane lining the body cavity and muscles. In some fish the body cavity fills with fluid, and the liver, kidneys, and spleen are enlarged.

HOST AND GEOGRAPHIC RANGE

Edwardsiella tarda has been isolated from many warmwater fishes and some coldwater fishes, whereas *E. ictaluri* has been isolated only from a few species of warmwater fishes listed in the table. Additionally, *E. tarda* causes disease in other animals such as marine mammals, pigs, turtles, alligators, ostriches, skunks, snakes, and (occasionally) in humans. In contrast, *E. ictaluri* is limited to fish.

The geographic range of *E. tarda* is worldwide, whereas that of *E. ictaluri* is still confined to the catfish growing areas of the United States where annual losses of fish are substantial.

SOURCE AND RESERVOIR OF INFECTION

Because *E. tarda* is widespread, many animals can serve as reservoirs of infection. Furthermore, the environment can be a source of infectivity because this bacterium survives as long as 76 days in pond water and mud. Fish that survive disease outbreaks serve as carriers and because *E. tarda* is prevalent in the intestines of turkey vultures, birds may also be an important reservoir of infection.

Catfish that survive epizootics of *E. ictaluri* probably also serve as reservoirs of infection, because fish are the only known host and the bacterium survives up to 8 days in pond water.

INCUBATION PERIOD

Incubation time is related to temperature; channel catfish infected with *E. tarda* and held at 81 F (27°C) died within 10 days; striped bass held at 72 F (22°C) began dying within 72 hours after exposure in a laboratory setting.

In another laboratory experiment, channel catfish injected with *E. ictaluri* died within 96 hours and fish exposed to this bacterium in aquarium water died within 2 weeks.

CONTROL

Prevention

Because both *E. tarda* and *E. ictaluri* are principally pathogens of warmwater fishes held in ponds, it is difficult to prevent disease outbreaks. Outbreaks of *E. ictaluri* infections occur at water temperatures of 75-82 F (24-28°C), and are thus restricted essentially to May– June and September–October. Management procedures that reduce stress during these months may lessen the severity of outbreaks.

Commercial production of a vaccine for *E. ictaluri* is feasible, but has not as yet been developed.

Treatment

Outbreaks of *E. tarda* or *E. ictaluri* can be controlled by feeding Terramycin (oxytetracycline) at the rate of 2.5-3.0 g/100 lb of fish per day for 10 days. However, a strain of Terramycin-resistant *E. tarda* from channel catfish has been reported. Romet has proven to be effective in controlling *E. ictaluri* outbreaks. The drug has been registered with the U.S. Food and Drug for use on *E. ictaluri* infections in catfishes at a daily rate of 2.5 g/100 lbs. of fish for 5 days.

SUGGESTED READING

Bullock, G. L. and R. L. Herman. 1985. *Edwardsiella* infections of fishes. U.S. Fish and Wildlife Service, Fish Disease Leaflet 71. 6 pp.

A technical description of *Edwardsiella tarda* and *E. ictaluri* infections in fish. Topics include diagnosis, pathology, host and geographic range,